STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

IN RE:	:	
	:	
APPLICATION OF NEW CINGULAR WIRELESS PCS, LLC AND TARPON TOWERS II, LLC FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED FOR A TELECOMMUNICATIONS FACILITY AT 92 GREENS FARMS ROAD, WESTPORT, CONNECTICUT	:	DOCKET NO. 510
	:	JULY 28, 2022

RESPONSES OF CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS TO CONNECTICUT SITING COUNCIL PRE-HEARING INTERROGATORIES – SET ONE

On July 8, 2022, the Connecticut Siting Council ("Council") issued Pre-Hearing Interrogatories – Set One to the Intervenor, Cellco Partnership d/b/a Verizon Wireless ("Cellco"), relating to Docket No. 510. Below are Cellco's responses.

General

Question No. 1

Provide details of the antennas and related equipment to be installed at the proposed facility.

Response

Cellco intends to install a total of twelve (12) antennas and twelve (12) remote radio heads ("RRH") on a triangular antenna platform at the 108-foot level on the proposed Tarpon Towers II ("Tarpon"). Cellco also intends to install two equipment cabinets, including a battery cabinet, and a 30-kW diesel generator in the northeast portion of the fenced facility compound. Copies of the antenna, RRH and generator specifications are included in Attachment 1.

Question No. 2

What is the estimated cost of Cellco's equipment, including installation? Break down the total cost into categories that Cellco deems appropriate.

Response

Cellco estimates the cost of its cell site radio equipment ($150,000), back-up generator ($25,000), Construction Contract and equipment installation ($130,000), and miscellaneous electrical and fiber installation ($25,000) at the proposed facility to be approximately $330,000.

Question No. 3

How would the cost of Cellco's installation/colocation at the proposed site be recovered?

Response

The costs associated with providing Cellco customers with the nation's most reliable wireless service network, including the cost for development of network infrastructure (small cells and macro-cells), are paid for by the individuals, corporations and government entities that purchase Cellco's service.

Question No. 4

Provide the number of remote radio heads that would be installed at this site.

Response

Cellco intends to install twelve (12) RRHs on its antenna platform.

Question No. 5

What type of antenna mount will be used for the proposed antennas? What is the structural design standard applicable to such antenna mount?

Response

Cellco will utilize a low-profile platform antenna mount at the Westport 3 facility. The

mounting system will be designed to comply with TIA-222-H.

Question No. 6

Pursuant to CGS §16-50p(a)(3)(G), identify the safety standards and/or codes by which equipment, machinery or technology that would be used or operated at the proposed facility by Cellco.

Response

- 2012 International Building Code with the 2016 CT Building Code Amendments.
- National Electric Code (NFPA70).
- 2005 CT State Fire Safety Code with the 2009 Amendments.
- TIA-222-G-4 "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures".
- Occupational Safety and Health Administration (OSHA).

Site Search

Question No. 7

When did Cellco commence a site search in the proposed service area?

Response

Cellco established its Westport 3 search ring in the first quarter of 2016. At the time the search ring was established, Verizon was aware that Tarpon had already leased the property at 92 Greens Farm and knew that this site would satisfy its wireless service objectives in the area.

Question No. 8

Identify the approximate center and radius of Cellco's site search area.

Response

The center of the search ring was located at 41.12361111, -73.345 and had a radius of

approximately one-half mile. *See* Attachment 2.

Question No. 9

Did Cellco examine other alternatives besides the proposed site? If yes, identify the locations and the reasons for their rejection.

Response

No. As briefly mentioned above, at the time Cellco established its search ring in 2016, it was aware that Tarpon had entered into a lease agreement with the property owner at 92 Greens Farm Road. Cellco determined that the Tarpon leased parcel would satisfy its wireless service objectives in the area and did not, on its own, search for any additional alternative sites. As described in the Application, Cellco did consider two (2) other locations that the Town suggested Tarpon explore as alternatives to 92 Greens Farm Road. (*See* Tarpon Application Exhibit F, Site #3 and #4). A tower of similar height at either of these alternative locations would be acceptable from an RF perspective. Finally, in 2021, Cellco was contacted by the owner of the 55 Greens Farm Road property and asked if it would be interested in using the existing office building rooftop as an alternative to the 92 Greens Farm Road tower site. Cellco's RF Engineers concluded that the rooftop is too low (approximately 30 feet) and that Cellco could not satisfy its wireless service objectives from this location.

Coverage/Capacity

Question No. 10

Provide a power density analysis including, but not limited to, the following: number of channels per sector for each antenna system that would be installed on the proposed tower; ERP per channel for each antenna system; frequency at which each antenna system would operate (indicate if a -10dB adjustment to account for antenna pattern is included in the analysis).

Response

See Attachment 3.

Question No. 11

What is the signal strength for which Cellco designs its system? For in-vehicle coverage? For in-building coverage?

Response

Cellco's design thresholds are Neg 95 dBm RSRP for in vehicle coverage and Neg 85 dBm RSRP for in in-building coverage.

Question No. 12

What is the existing signal strength within the area Cellco is seeking to cover from this site?

Response

The existing signal strength in the area around 92 Greens Farm Road is >/= Neg 105dBM RSRP. There are a few small areas, near the subject parcel, where the existing signal strength is </= Neg 95dBm RSRP, at 700 MHz.

Question No. 13

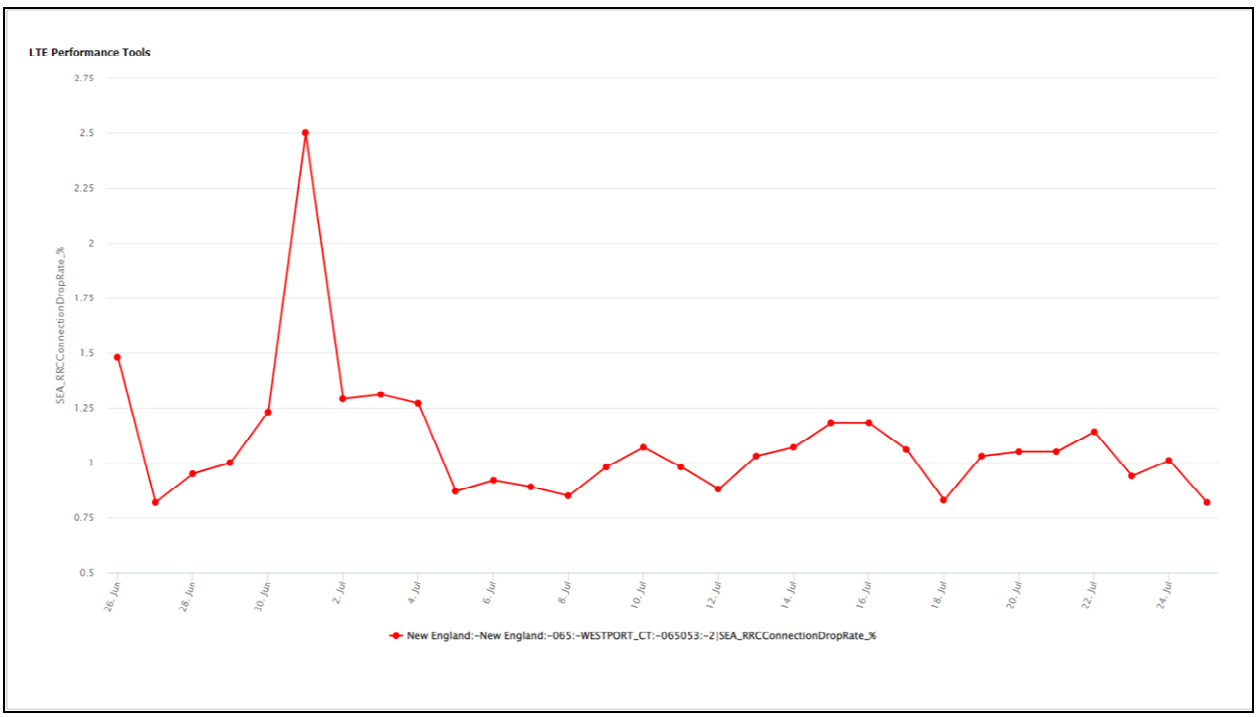
Does Cellco have any statistics on dropped calls and/or ineffective attempts in the vicinity of the proposed facility? If so, what do they indicate? Does Cellco have any other indicators of substandard service in this area?

Response

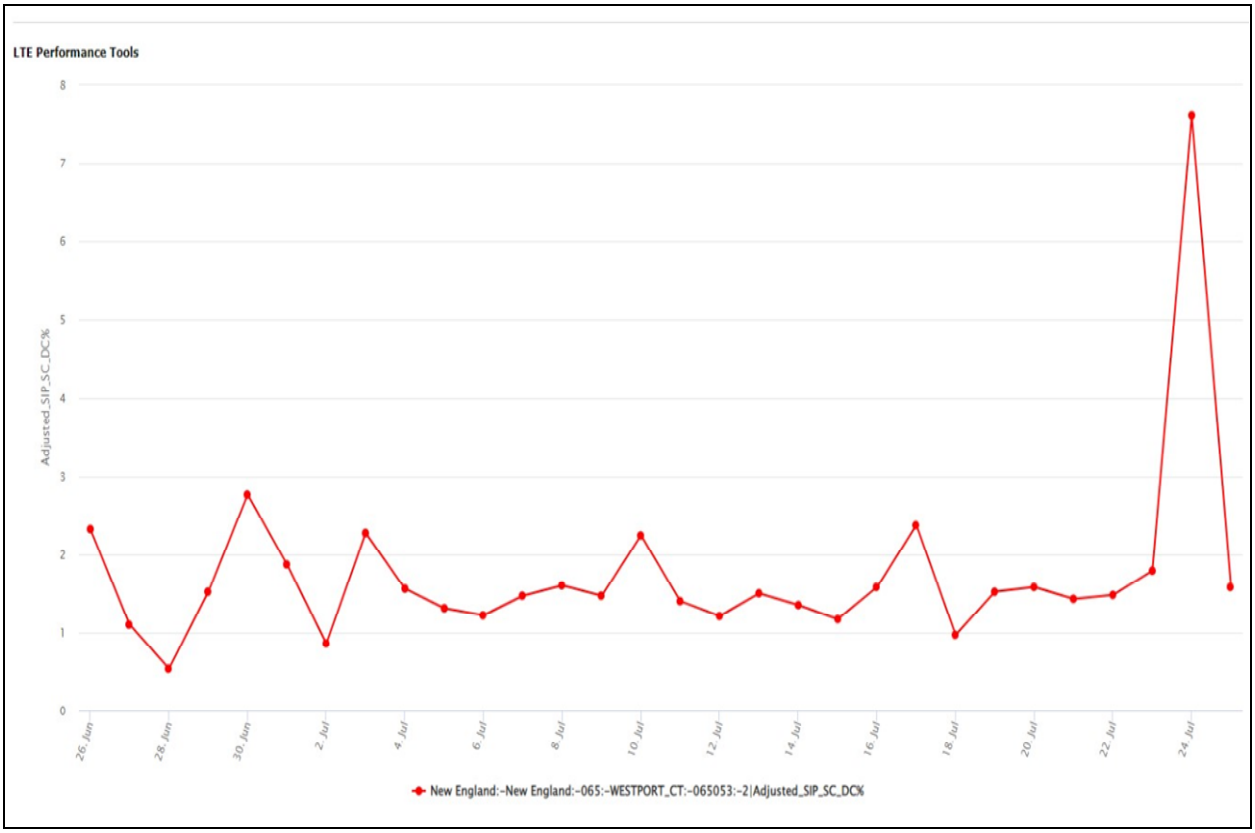
Typically, Cellco will provide such data for the sector or sectors of antennas that may be operating at or above their respective capacity limits. In this case, the data provided relates to Cellco's Beta sector antennas at the Westport CT cell site. As mentioned above, this antenna

sector is currently operating beyond its existing capacity limits which impacts system performance.

Below are two Key Network Performance Indicator graphs which show how the performance of the WESTPORT CT Beta sector is impacted.



The graph above shows the RRC ("Radio Resource Control") Connection Drop Rate, which is the percentage of unsuccessful attempts the User Equipment ("UE") has tried to re-establish a connection to the network after being dropped. (Data for one month between June 26 – July 25, 2022). On a daily average the WESTPORT CT Beta sector gets approximately 475,000 connections. About 7000 of those connections are unsuccessful, or 1.5%. Cellco's performance target for Connection Drop Rate is less than 1%.



The graph above shows the Session Initiation Protocol -- Dropped Calls, which is the percentage of unsuccessful attempts the UE has tried to establish a connection to the network for the first time. (Data for one month between June 26 – July 25, 2022). On a daily average the WESTPORT CT Beta sector experiences approximately 4000 attempts; approximately 60 attempts are unsuccessful, which is about 1.5%. Cellco's performance targets for System Drop Rate is less than 1%.

Question No. 14

How will the proposed site improve upon the existing wireless service in the area. Include data on additional road miles and additional coverage area footprint that would be served by the proposed facility.

Response

With antennas at 108-foot level on the proposed tower site at 92 Greens Farms Road, Cellco will be able to provide its customers and emergency service providers with significant improvements in service in the area, including portions of Interstate 95 and the Metro North Rail line.

Street Name	700 MHz coverage in mi		850 MHz coverage in mi		1900 MHz coverage in mi		2100 MHz coverage in mi		3550 MHz coverage in mi		3700 MHz coverage in mi	
	RSRP -85 dBm	RSRP -95 dBm	RSRP -85 dBm	RSRP -95 dBm	RSRP -85 dBm	RSRP -95 dBm	RSRP -85 dBm	RSRP -95 dBm	RSRP -85 dBm	RSRP -95 dBm	RSRP -85 dBm	RSRP -95 dBm
I-95	2.1	2.6	1.6	2.27	0.7	1.5	0.6	1.5	0.2	0.6	0.79	1.5
Greens Farm Road	1	2.6	0.8	1.23	0.18	0.7	0.11	0.5	0.08	0.15	0.55	0.95
Railroad	1.6	2.5	1.36	2.14	0.4	1.5	0.3	1.5	0.05	0.4	0.7	1.45
Hills Point Road	1	1.7	0.83	1.4	0.55	0.75	0.35	0.73	0.06	0.29	0.63	0.88
Overall Coverage Footprint	**1.54 Sq mi**	**3.36 Sq mi**	**1.05 Sq mi**	**2.45 Sq mi**	**0.15 Sq mi**	**1.01 Sq mi**	**0.1 Sq mi**	**0.82 Sq mi**	**0.02 Sq mi**	**0.07 Sq mi**	**0.36 Sq mi**	**1.08 Sq mi**

Question No. 15

What frequencies would be installed at the site? Would all frequencies provide both voice and data? Please explain.

Response

Cellco will deploy its 700 MHz, 850 MHz, 1900 MHz, 2100 MHz, 3550 MHz and 3700 MHz, frequencies at the Westport 3 cell site. All frequencies would provide both voice and data services.

Question No. 16

Provide existing coverage gaps in miles for the proposed frequencies for the nearby portion of the Interstate 95, the Metro North Railroad and the surrounding local roads, the overall existing coverage footprints in square miles and the proposed coverage mileage and square miles as represented in the example below:

Street Name	700 MHz Coverage Gap	1900 MHz Coverage Gap	2100 MHz Coverage Gap
Route 2	2.5 miles	5 miles	4.5 miles
Route 32	1.0 mile	3 miles	2 miles
Route 87	0.5 mile	2.5 miles	1 mile
Interstate 395	2.5 miles	2.5 miles	2.5 miles
State Road Total	6.5 miles	13 miles	10 miles
Overall Coverage Footprint	49 square miles	6 square miles	7.5 square miles

Response

Street Name	700 MHz coverage gap in mi		1900 MHz coverage gap in mi		2100 MHz coverage gap in mi	
	RSRP -85 dBm	RSRP -95 dBm	RSRP -85 dBm	RSRP -95 dBm	RSRP -85 dBm	RSRP -95 dBm
I-95	1.45	0.5	2.1	1.7	1.55	0.68
Greens Farm Road	1.45	0.65	2.3	1.2	1.9	0.78
Railroad	1.7	0.65	2	1.5	1.5	0.75
Hills Point Road	1.75	1.25	2	2	1.35	1

	700 MHz in Sq. Miles		1900 MHz in Sq. miles		2100 MHz in Sq. miles	
	RSRP -85 dBm	RSRP -95 dBm	RSRP -85 dBm	RSRP -95 dBm	RSRP -85 dBm	RSRP -95 dBm
Overall Coverage Footprint from 92 Greens Farms Rd only	1.54	3.36	0.16	1.01	0.11	0.82

Question No. 17

What is Cellco's existing and predicted coverage footprint from the proposed site (in square miles), at each frequency that would be installed?

Response

See response to Q. 16 above.

Question No. 18

Please provide the distances and directions to the adjacent sites with which the proposed facility would hand off signals. Include antenna centerline heights for Cellco at these sites.

Response

Site ID	**Site Location Name**	**Address**	**Latitude Degrees (NAD83)**	**Longitude Degrees (NAD83)**	**Antenna Centerline (ft)**	**Site Structure Type**	**Distance from the Site, WESTPORT 3 CT and direction**
065051	Westport S CT	1 Post Office Ln. Westport CT 06880	41.123444	-73.313067	100	Self-Support	1.65 mi E
065053	Westport CT	880 Post Rd. East Unit 1 Westport CT 06880	41.137475	-73.334364	160	Self-Support	1.9 mi N
065055	Westport W CT	33 Riverside Ave. Westport CT 06880	41.139542	-73.363729	LTE 56.5, 69; C-band 58, 70.5	Building Façade Mounted Antenna	1.47 mi NW
065057	Saugatuck CT	21 Charles St. Westport CT 06880	41.119839	-73.371229	70	Building Façade Mounted Antenna	1.38 mi W
065414	Westport SW 2 CT	274 Riverside Ave Westport CT 06880	41.130892	-73.36885	82	Building Façade Mounted Antenna	1.34 mi NW

Site ID	Site Location Name	Address	Latitude Degrees (NAD83)	Longitude Degrees (NAD83)	Antenna Centerline (ft)	Site Structure Type	Distance from the Site, WESTPORT 3 CT and direction
065534	Westport SC2 CT	66 Hales Rd Westport CT 06880	41.122703	-73.353575	25	Utility Pole	0.43 mi W
065534	Westport SC1 CT	Compo Beach Rd Westport CT 06880	41.107011	-73.354255	30	Utility Pole	1.24 mi SW
065534	Westport SC 2A CT	Hills point Rd Pole 26197 Westport CT 06880	41.122379	-73.346015	37	Utility Pole	0.1 mi SW
065534	Westport SC15 CT	233 Hillspoint Rd Westport CT 06880	41.112796	-73.346394	24.8	Utility Pole	0.75 mi S
065535	Westport CT SC4	9 Soundview Drive Westport CT 06880	41.106767	-73.350486	25.8	Utility Pole	1.2 mi S

Question No. 19

What nearby wireless facilities (or sectors) are nearing capacity limits? At what frequencies? Please include a projected exhaustion date for each of these sectors. Would the deployment of the proposed facility be sufficient to address these capacity concerns, or would an additional facility be required in the near term to off-load traffic?

Response

The existing Westport CT – Beta sector antennas are currently exhausting in Cellco's 700 MHz, 850 MHz, 1900 MHz, 2100 MHz frequencies. The proposed 92 Greens Farm Road site will help offload Westport CT – Beta sector antennas, which currently provides service primarily

to customers travelling along I-95. We do not anticipate a need for an additional facility in this general area in the near future.

Question No. 20

Can Cellco's coverage objectives be met by installing antennas at a lower tower height? Identify the lowest possible antenna height and describe how this height would affect coverage needs and/or capacity relief within the proposed service area.

Response

The lowest antenna height at which Cellco can achieve its coverage objectives is 108 feet. Going lower on the proposed Tarpon tower would result in a reduction of the overall coverage footprint, especially at the higher frequencies (1900MHz, 2100MHz).

Question No. 21

Would flush-mounted antennas provide the required coverage? Would the flush-mount configuration result in reduced coverage and/or necessitate greater antenna height with multiple levels of antennas? Explain.

Response

No. Cellco's antennas need to be mounted in a side by side configuration to take advantage of a feature called beamforming which improves the overall capacity of an individual cell site. Flush mounting antennas at different heights would result in decreased capacity, preventing beamforming.

Question No. 22

Would the deployment of the proposed facility be sufficient to address Cellco's capacity concerns or would an additional facility be required in the near term to off-load traffic?

Response

Cellco does not anticipate the need for an additional facility in the area in the near term.

Question No. 23

Are any of the frequencies planned for installation at this facility capable of providing 5G services for Cellco's network? If so, identify the frequencies.

Response

Yes. Cellco's 5G wireless services will utilize its 850MHz frequency in combination with 2100 MHz frequency using carrier aggregation initially and 3700 MHz frequency for future 5G technologies.

Backup Power

Question No. 24

Would Cellco install its own emergency backup generator?

Response

Yes. Due to space limitations in the facility compound and Cellco's inability to install a propane fuel tank, Cellco intends to install a 30-kW diesel-fueled generator at the proposed tower site. Due to the site's proximity to off-site wetlands, Cellco's generator will include a special 200 gallon diesel fuel tank with tertiary containment measures and leak detection alarms. Specifications for the diesel generator are included in Attachment 1.[1]

[1] Notwithstanding Tarpon's suggestion on p. 26 of the Application narrative, that provisions have been made for the use of natural gas generators at the site, Cellco intends to install a diesel generator for backup power. The special tertiary containment measures incorporated into the design of the generator's diesel fuel tank together with the relocation of the generator to the northeast corner of the facility compound, further from the nearest wetland area, will reduce, if not eliminate any potential impact to the off-site wetland resources. By using a diesel-fueled generator Cellco estimates that it will be able to save between $35,000 and 50,000 in additional project cost.

Question No. 25

What is the capacity (kW) of the proposed emergency backup generator?

Response

Cellco will install a 30-kW diesel generator.

Question No. 26

Would Cellco's backup generator run periodically for maintenance purposes? If so, at what frequency and duration? Would this be scheduled for daytime hours?

Response

Cellco will exercise its backup generator once every two weeks for approximately 20-30 minutes, during the daytime hours.

Question No. 27

Would Cellco's backup generator be managed to comply with Regulations of Connecticut State Agencies Section 22a-174-3b?

Response

Yes. Under normal operating conditions, Cellco's cell site equipment would generate no air emissions. As mentioned above, during the loss of commercial power and periodically for maintenance purposes, Cellco would utilize a diesel-fueled generator to provide emergency back-up power to the proposed cell site. Cellco's back-up generator will be managed to comply with the "permit by rule" criteria established by the Connecticut Department of Energy and Environmental Protection ("DEEP") Bureau of Air Management pursuant to R.C.S.A. § 22a-174-3b.

Question No. 28

Would a battery backup (if applicable) be used by Cellco to provide uninterrupted power and prevent a reboot condition? How long could the battery backup alone supply power to the

facility in the event that the generator fails to start?

Response

Yes, Cellco's proposed battery backup battery system would provide uninterrupted power to the cell site and prevent a reboot condition. The backup battery system is designed to keep the cell site operating for up to four (4) hours.

Public Safety

Question No. 29

Would Cellco's equipment support text-to-911 service? Is additional equipment required for this purpose?

Response

Yes.

Question No. 30

Would Cellco's antennas comply with federal E911 requirements?

Response

Yes.

Question No. 31

Would Cellco's installation comply with the intent of the Warning, Alert and Response Network Act of 2006?

Response

Yes.

CERTIFICATE OF SERVICE

I hereby certify that on the 28th day of July, 2022, a copy of the foregoing was sent, via electronic mail, to:

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ATTACHMENT 1

SAMSUNG

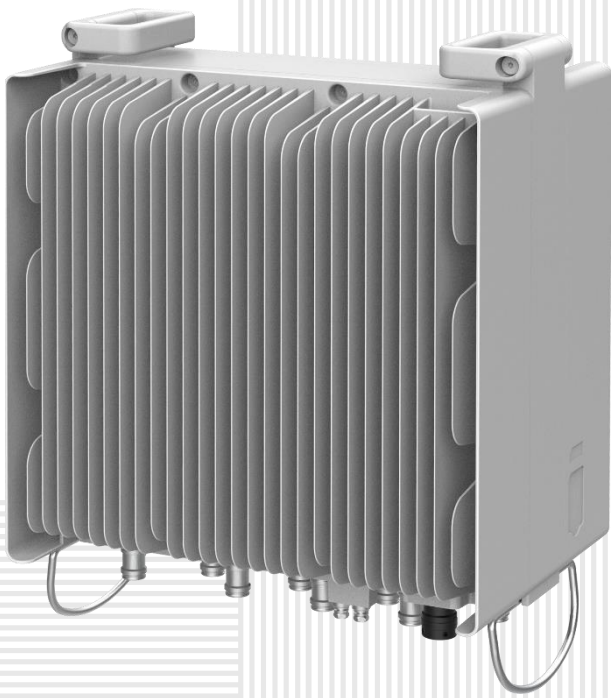
AWS/PCS MACRO RADIO

DUAL-BAND AND HIGH POWER FOR MACRO COVERAGE

Samsung's future proof dual-band radio is designed to help effectively increase the coverage areas in wireless networks. This AWS/PCS 4T4R dual-band radio has 4Tx/4Rx to 2Tx/2Rx RF chains options and a total output power of 320W, making it ideal for macro sites.

57196

Model Code	RF4439d-25A



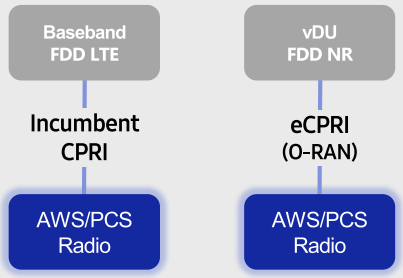
Homepage
samsungnetworks.com

Youtube
www.youtube.com/samsung5g

Points of Differentiation

Continuous Migration

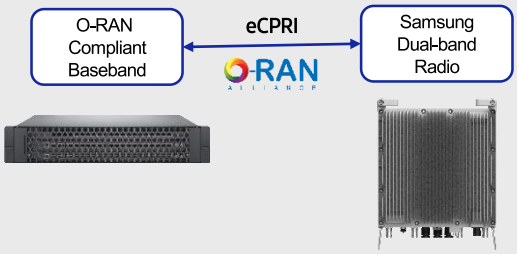
Samsung's AWS/PCS macro radio can support each incumbent CPRI interface as well as advanced eCPRI interfaces. This feature provides installable options for both legacy LTE networks and added NR networks.



O-RAN Compliant

A standardized O-RAN radio can help in implementing cost-effective networks, which are capable of sending more data without compromising additional investments.

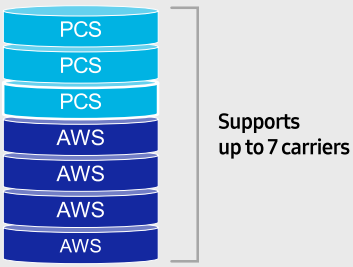
Samsung's state-of-the-art O-RAN technology will help accelerate the effort toward constructing a solid O-RAN ecosystem.



Optimum Spectrum Utilization

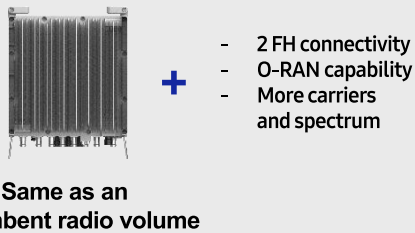
The number of required carriers varies according to site (region). Supporting many carriers is essential for using all frequencies that the operator has available.

The new AWS/PCS dual-band radio can support up to 3 carriers in the PCS (1.9GHz) band and 4 carriers in the AWS (2.1GHz) band, respectively.



Brand New Features in a Compact Size

Samsung's AWS/PCS macro radio offers several features, such as dual connectivity for baseband for both CDU and vDU, O-RAN capability, more carriers and an enlarged PCS spectrum, combined into an incumbent radio volume of 36.8L.



Technical Specifications

Item	Specification
Tech	LTE / NR
Brand	B25(PCS), B66(AWS)
Frequency Band	DL: 1930 – 1995MHz, UL: 1850 – 1915MHz DL: 2110 – 2200MHz, UL: 1710 – 1780MHz
RF Power	(B25) 4 × 40W or 2 × 60W (B66) 4 × 60W or 2 × 80W
IBW/OBW	(B25) 65MHz / 30MHz (B66) DL 90MHz, UL 70MHz / 60MHz
Installation	Pole, Wall
Size/ Weight	14.96 x 14.96 x 10.04inch (36.8L) / 74.7lb

SAMSUNG

700/850MHZ MACRO RADIO

DUAL-BAND AND HIGH POWER FOR MACRO COVERAGE

Samsung's future proof dual-band radio is designed to help effectively increase the coverage areas in wireless networks. This 700/850MHz 4T4R dual-band radio has 4Tx/4Rx to 2Tx/2Rx RF chains options and a total output power of 320W, making it ideal for macro sites.

Model Code	RF4440d-13A

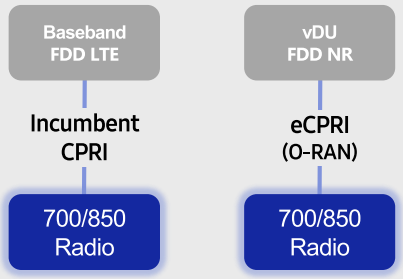
Homepage
samsungnetworks.com

Youtube
www.youtube.com/samsung5g

Points of Differentiation

Continuous Migration

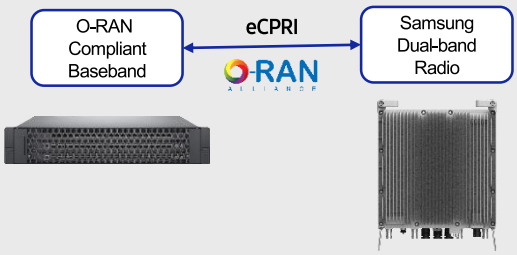
Samsung's 700/850MHz macro radio can support each incumbent CPRI interface as well as an advanced eCPRI interface. This feature provides installable options for both legacy LTE networks and added NR networks.



O-RAN Compliant

A standardized O-RAN radio can help when implementing cost-effective networks because it is capable of sending more data without compromising additional investments.

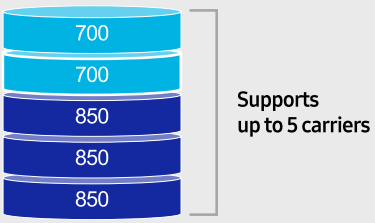
Samsung's state-of-the-art O-RAN technology will help accelerate the effort toward constructing a solid O-RAN ecosystem.



Optimum Spectrum Utilization

The number of required carriers varies according to site (region). The ability to support many carriers is essential for using all frequencies that the operator has available.

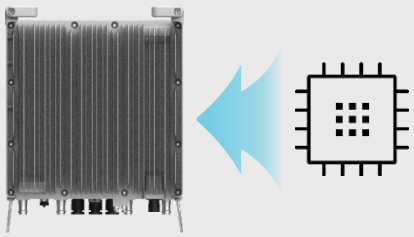
The new 700/850MHz dual-band radio can support up to 2 carriers in the B13 (700MHz) band and 3 carriers in the B5 (850MHz) band, respectively.



Secured Integrity

Access to sensitive data is allowed only to authorized software.

The Samsung radio's CPU can protect root of trust, which is credential information to verify SW integrity, and secure storage provides access control to sensitive data by using dedicated hardware (TPM).



Technical Specifications

Item	Specification
Tech	LTE / NR
Brand	B13(700MHz), B5(850MHz)
Frequency Band	DL: 746 – 756MHz, UL: 777 – 787MHz DL: 869 – 894MHz, UL: 824 – 849MHz
RF Power	(B13) 4 × 40W or 2 × 60W (B5) 4 × 40W or 2 × 60W
IBW/OBW	(B13) 10MHz / 10MHz (B5) 25MHz / 25MHz
Installation	Pole, Wall
Size/ Weight	14.96 x 14.96 x 9.05inch (33.2L) / 70.33 lb

JAHH-45B-R3B

8-port sector antenna, 2x 698–798, 2x 824-894 and 4x 1695–2360 MHz, 45° HPBW, low bands each have a RET and the high bands share a RET. Two internal SBTs.

- Internal SBT on low and high band allow remote RET control from the radio over the RF jumper cable
- One RET for 700MHz, one RET for 850MHz, and one RET for both high bands to ensure same tilt level for 4x Rx or 4x MIMO
- Internal filter on low band and interleaved dipole technology providing for attractive, low wind load mechanical package
- Separate RS-485 RET input/output for low and high band
- Narrow beamwidth capacity antenna for higher level of densification and enhanced data throughput

General Specifications

Antenna Type	Sector
Band	Multiband
Color	Light gray
Effective Projective Area (EPA), frontal	1 m² | 10.764 ft²
Effective Projective Area (EPA), lateral	0.21 m² | 2.26 ft²
Grounding Type	RF connector body grounded to reflector and mounting bracket
Performance Note	Outdoor usage | Wind loading figures are validated by wind tunnel measurements described in white paper WP-112534-EN
Radome Material	Fiberglass, UV resistant
Radiator Material	Aluminum | Low loss circuit board
Reflector Material	Aluminum
RF Connector Interface	4.3-10 Female
RF Connector Location	Bottom
RF Connector Quantity, high band	4
RF Connector Quantity, low band	4
RF Connector Quantity, total	8

Remote Electrical Tilt (RET) Information, General

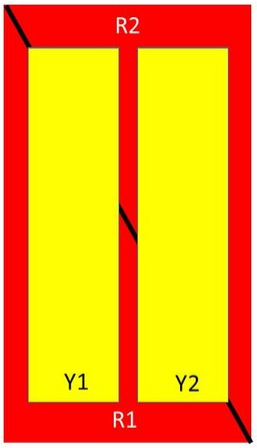
RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	2 female | 2 male

JAHH-45B-R3B

Dimensions

Width	457 mm | 17.992 in
Length	1829 mm | 72.008 in
Depth	178 mm | 7.008 in

Array Layout

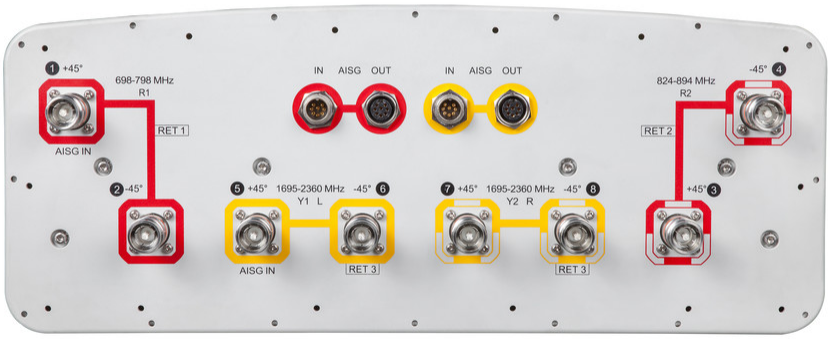


(Sizes of colored boxes are not true depictions of array sizes)

Array	Freq (MHz)	Conns	RET (SRET)	AISG RET UID
R1	698-798	1-2	1	ANxxxxxxxxxxxxxxxx1
R2	824-894	3-4	2	ANxxxxxxxxxxxxxxxx2
Y1	1695-2360	5-6	3	ANxxxxxxxxxxxxxxxx3
Y2	1695-2360	7-8		

Port Configuration

JAHH-45B-R3B



Electrical Specifications

Impedance	50 ohm
Operating Frequency Band	1695 – 2360 MHz | 698 – 798 MHz | 824 – 894 MHz
Polarization	±45°
Total Input Power, maximum	800 W @ 50 °C

Remote Electrical Tilt (RET) Information, Electrical

Protocol	3GPP/AISG 2.0 (Single RET)
Power Consumption, idle state, maximum	1 W
Power Consumption, normal conditions, maximum	8 W
Input Voltage	10–30 Vdc
Internal Bias Tee	Port 1 | Port 5
Internal RET	High band (1) | Low band (2)

Electrical Specifications

Frequency Band, MHz	**698–798**	**824–894**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain, dBi	16.5	17.2	19.4	20.2	20.5	21.1
Beamwidth, Horizontal, degrees	48	43	44	43	41	38

JAHH-45B-R3B

Beamwidth, Vertical, degrees	12.6	11.2	5.8	5.4	5	4.5
Beam Tilt, degrees	2–14	2–14	0–8	0–8	0–8	0–8
USLS (First Lobe), dB	16	21	18	18	18	18
Front-to-Back Ratio at 180°, dB	32	36	37	37	38	41
Isolation, Cross Polarization, dB	25	25	25	25	25	25
Isolation, Inter-band, dB	30	30	28	28	28	28
VSWR | Return loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	200	200	300	300	300	250

Electrical Specifications, BASTA

Frequency Band, MHz	**698–798**	**824–894**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain by all Beam Tilts, average, dBi	16.3	17	19.1	19.9	20.2	20.9
Gain by all Beam Tilts Tolerance, dB	±0.3	±0.3	±0.5	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	2 ° | 16.3 8 ° | 16.3 14 ° | 16.1	2 ° | 17.1 8 ° | 17.1 14 ° | 16.7	0 ° | 19.1 4 ° | 19.2 8 ° | 19.0	0 ° | 19.8 4 ° | 19.9 8 ° | 19.8	0 ° | 20.1 4 ° | 20.2 8 ° | 20.1	0 ° | 20.7 4 ° | 21.0 8 ° | 20.7
Beamwidth, Horizontal Tolerance, degrees	±1.1	±2.4	±2	±2.7	±2.9	±1.5
Beamwidth, Vertical Tolerance, degrees	±0.7	±0.6	±0.3	±0.2	±0.3	±0.1
USLS, beampeak to 20° above beampeak, dB	16	21	17	17	17	17
Front-to-Back Total Power at 180° ± 30°, dB	23	24	29	31	33	34
CPR at Boresight, dB	25	26	20	21	20	20
CPR at Sector, dB	16	18	14	15	15	16

Mechanical Specifications

Wind Loading at Velocity, frontal	1,065.0 N @ 150 km/h
Wind Loading at Velocity, lateral	220.0 N @ 150 km/h
Wind Loading at Velocity, maximum	1,065.0 N @ 150 km/h | 239.4 lbf @ 150 km/h
Wind Loading at Velocity, rear	245.3 lbf @ 150 km/h | 935.0 N @ 150 km/h
Wind Speed, maximum	241 km/h | 149.75 mph

JAHH-45B-R3B

Packaging and Weights

Width, packed	608 mm | 23.937 in
Depth, packed	346 mm | 13.622 in
Length, packed	1970 mm | 77.559 in
Net Weight, without mounting kit	41.5 kg | 91.492 lb
Weight, gross	71.5 kg | 157.63 lb

Regulatory Compliance/Certifications

Agency	**Classification**
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

Included Products

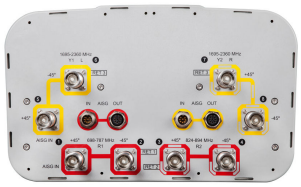
BSAMNT-3 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

BSAMNT-M — Middle Downtilt Mounting Kit for Long Antennas for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor bracket set.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

JAHH-65B-R3B



8-port sector antenna, 2x 698–787, 2x 824-894 and 4x 1695–2360 MHz, 65° HPBW, 3x RET and low bands have diplexers. Internal SBT's on first LB(Port 1) and first HB(Port 5).

- Internal SBT on low and high band allow remote RET control from the radio over the RF jumper cable
- One RET for 700MHz, one RET for 850MHz, and one RET for both high bands to ensure same tilt level for 4x Rx or 4x MIMO
- Internal filter on low band and interleaved dipole technology providing for attractive, low wind load mechanical package
- Separate RS-485 RET input/output for low and high band

General Specifications

Antenna Type	Sector
Band	Multiband
Color	Light gray
Effective Projective Area (EPA), frontal	0.28 m^2 | 3.014 ft^2
Effective Projective Area (EPA), lateral	0.24 m^2 | 2.583 ft^2
Grounding Type	RF connector body grounded to reflector and mounting bracket
Performance Note	Outdoor usage | Wind loading figures are validated by wind tunnel measurements described in white paper WP-112534-EN
Radome Material	Fiberglass, UV resistant
Radiator Material	Aluminum | Low loss circuit board
Reflector Material	Aluminum
RF Connector Interface	4.3-10 Female
RF Connector Location	Bottom
RF Connector Quantity, high band	4
RF Connector Quantity, low band	4
RF Connector Quantity, total	8

Remote Electrical Tilt (RET) Information, General

RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	2 female | 2 male

Dimensions

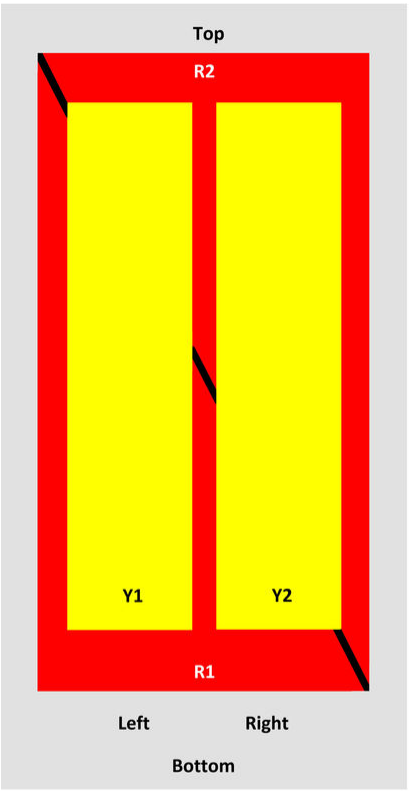
Width	350 mm | 13.78 in

JAHH-65B-R3B

Length	1828 mm | 71.969 in
Depth	208 mm | 8.189 in

Array Layout

JAHH-65A-R3B JAHH-65B-R3B JAHH-65C-R3B



Array	Freq (MHz)	Conns	RET (SRET)	AISG RET UID
R1	698-798	1-2	1	ANxxxxxxxxxxxxxxx1
R2	824-894	3-4	2	ANxxxxxxxxxxxxxxx2
Y1	1695-2360	5-6	3	ANxxxxxxxxxxxxxxx3
Y2	1695-2360	7-8		

View from the front of the antenna

(Sizes of colored boxes are not true depictions of array sizes)

Electrical Specifications

Impedance	50 ohm
Operating Frequency Band	1695 – 2360 MHz | 698 – 787 MHz | 824 – 894 MHz
Polarization	±45°

Remote Electrical Tilt (RET) Information, Electrical

Protocol	3GPP/AISG 2.0 (Single RET)
Power Consumption, idle state, maximum	2 W

JAHH-65B-R3B

Power Consumption, normal conditions, maximum	13 W
Input Voltage	10–30 Vdc
Internal Bias Tee	Port 1 | Port 5
Internal RET	High band (1) | Low band (2)

Electrical Specifications

Frequency Band, MHz	**698–787**	**824–894**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain, dBi	14.5	15.8	18	18.4	18.5	18.8
Beamwidth, Horizontal, degrees	67	65	63	63	65	68
Beamwidth, Vertical, degrees	12.4	10.5	5.7	5.2	4.9	4.4
Beam Tilt, degrees	2–14	2–14	0–10	0–10	0–10	0–10
USLS (First Lobe), dB	18	18	20	20	21	23
Front-to-Back Ratio at 180°, dB	32	34	31	35	36	38
Isolation, Cross Polarization, dB	25	25	25	25	25	25
Isolation, Inter-band, dB	30	30	30	30	30	30
VSWR | Return loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port at 50° C, maximum, watts	200	200	300	300	300	250

Electrical Specifications, BASTA

Frequency Band, MHz	**698–787**	**824–894**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain by all Beam Tilts, average, dBi	14.3	14.9	17.6	18.1	18.2	18.5
Gain by all Beam Tilts Tolerance, dB	±0.3	±0.5	±0.6	±0.4	±0.5	±0.6
Gain by Beam Tilt, average, dBi	2 ° | 14.3 8 ° | 14.3 14 ° | 14.3	2 ° | 15.0 8 ° | 14.9 14 ° | 15.4	0 ° | 17.2 5 ° | 17.6 10 ° | 17.6	0 ° | 17.6 5 ° | 18.2 10 ° | 18.2	0 ° | 17.7 5 ° | 18.3 10 ° | 18.3	0 ° | 17.9 5 ° | 18.7 10 ° | 18.7
Beamwidth, Horizontal Tolerance, degrees	±1.2	±1.4	±4	±2.4	±2.9	±2.7
Beamwidth, Vertical Tolerance, degrees	±0.9	±0.5	±0.3	±0.2	±0.3	±0.1
USLS, beampeak to 20° above beampeak, dB	18	17	17	18	19	18
Front-to-Back Total Power at 180° ± 30°, dB	25	24	26	29	27	29
CPR at Boresight, dB	22	23	20	21	21	24

CPR at Sector, dB	11	12	11	11	11	8

Mechanical Specifications

Wind Loading at Velocity, frontal	301.0 N @ 150 km/h | 67.7 lbf @ 150 km/h
Wind Loading at Velocity, lateral	254.0 N @ 150 km/h | 57.1 lbf @ 150 km/h
Wind Loading at Velocity, maximum	143.4 lbf @ 150 km/h | 638.0 N @ 150 km/h
Wind Speed, maximum	241 km/h | 149.75 mph

Packaging and Weights

Width, packed	456 mm | 17.953 in
Depth, packed	357 mm | 14.055 in
Length, packed	1975 mm | 77.756 in
Net Weight, without mounting kit	29.2 kg | 64.375 lb
Weight, gross	42.5 kg | 93.696 lb

Regulatory Compliance/Certifications

Agency	Classification
CHINA-ROHS	Above maximum concentration value
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system
ROHS	Compliant/Exempted

Included Products

BSAMNT-3	—	Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

SAMSUNG

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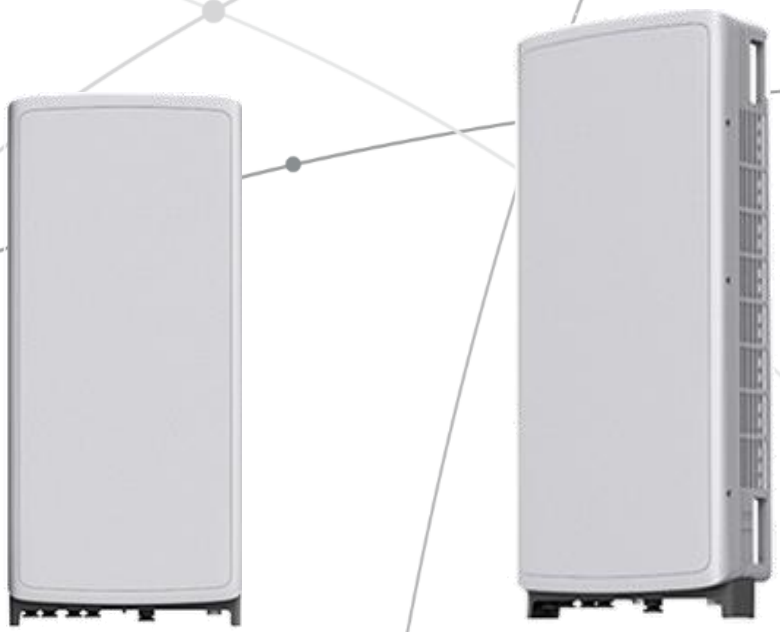
C-Band 64T64R Massive MIMO Radio

for High Capacity and Wide Coverage

Samsung C-Band 64T64R Massive MIMO Radio enables mobile operators to increase coverage range, boost data speeds and ultimately offer enriched 5G experiences to users in the U.S..

Model Code : MT6407-77A

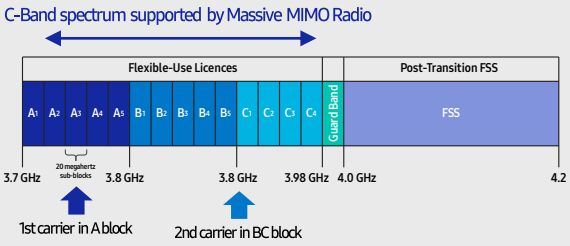


Points of Differentiation

Wide Bandwidth

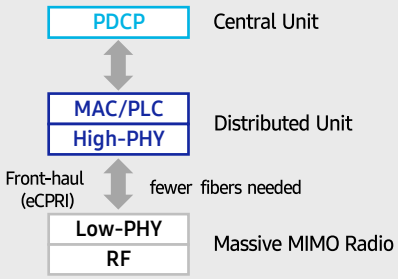
With capability to support up to 2 CC carrier configuration, Samsung C-Band massive MIMO Radio supports 200 MHz bandwidth in the C-Band spectrum.

Samsung C-Band massive MIMO Radio covers the entire C-Band 280 MHz spectrum, so it can meet the operator's needs in current A block and future B/C blocks



Future Proof Product

Samsung C-Band 64T64R Massive MIMO radio supports not only CPRI but also eCPRI as front-haul interface.
It enables operators can cut down on OPEX/CAPEX by reducing front-haul bandwidth through low layer split and using ethernet based higher efficient line.



Enhanced Performance

C-Band massive MIMO Radio creates sharp beams and extends networks' coverage on the critical mid-band spectrum using a large number of antenna elements and high output power to boost data speeds.

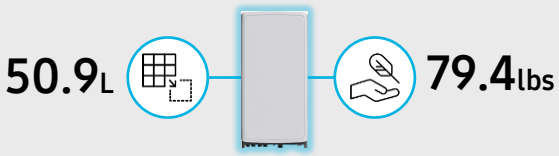
This helps operators reduce their CAPEX as they now need less products to cover the same area than before.

Furthermore, as C-Band massive MIMO Radio supports MU-MIMO(Multi-user MIMO) , it enables to increase user throughput by minimizing interference.

Well Matched Design

Samsung C-Band Massive MIMO radio utilizes 64 antennas, supports up to 280MHz bandwidth, and delivers a 200W output power. despite the above advanced performance, the Radio has a compact size of 50.9L and 79.4lbs. This makes it easy to install the Radio.

It is designed to look solid and compact, with a low profile appearance so that, when installed, harmonizes well with the surrounding environment..



Technical Specifications

Item	Specification
Tech	NR
Band	n77
Frequency Band	3700 - 3980 MHz
EIRP	78.5dBm (53.0 dBm+25.5 dBi)
IBW/OBW	280 MHz / 200 MHz
Installation	Pole/Wall
Size/ Weight	16.06 x 35.06 x 5.51 inch (50.86L)/ 79.4 lbs

SAMSUNG

About Samsung Electronics Co., Ltd.

Samsung inspires the world and shapes the future with transformative ideas and technologies. The company is redefining the worlds of TVs, smartphones, wearable devices, tablets, digital appliances, network systems, and memory, system LSI, foundry and LED solutions.

129 Samsung-ro, Yeongtong-gu, Suwon-si Gyeonggi-do, Korea

[CBRS] Clip-on Antenna Specifications

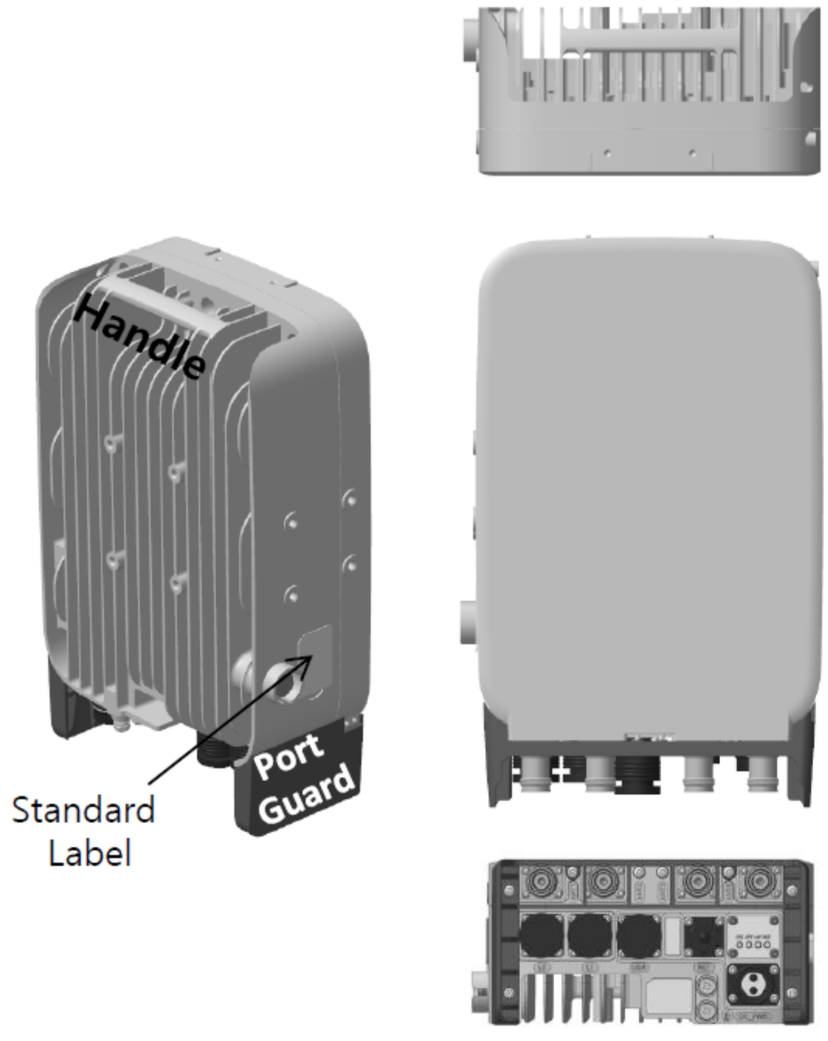
VzW accepted IP45 in FLD, but IP55 is Samsung Spec.

Items	Clip-on Antenna, BASTA**
Antenna Gain	12.5 ± 0.5 dBi (Max 13 dBi)
Horizontal BW (-3dB)	65° ± 5°
Vertical BW (-3dB)	17° ±3°
Electrical Tilt	8° (fixed) ±2°
Front-to-Back Ratio	> 25 dB
Port-to-Port Tracking	< 3 dB
VSWR	< 1.5
Isolation	> 25 dB
Ingress Protection	**IP55**
Size	220(W)×313(H)×34.3(D) mm (*) (8.7 x 12.3 x 1.4 inch.)
Weight	< **2.0** kg [Typ. 1.3 kg]
It is required that the radio should be weatherproofed properly with JMA WPS Boot with external antenna or with Weatherproof Boot for clip-on antennas.	

Antenna includes integrated cable with connector
* Design is subject to minor change

** Ant. spec. follows NGMN recommendations on Base Station Antenna Standards (BASTA). For example, 'mean ± tolerance of 86.6%' is applied to double-sided specification of statistical RF parameters.

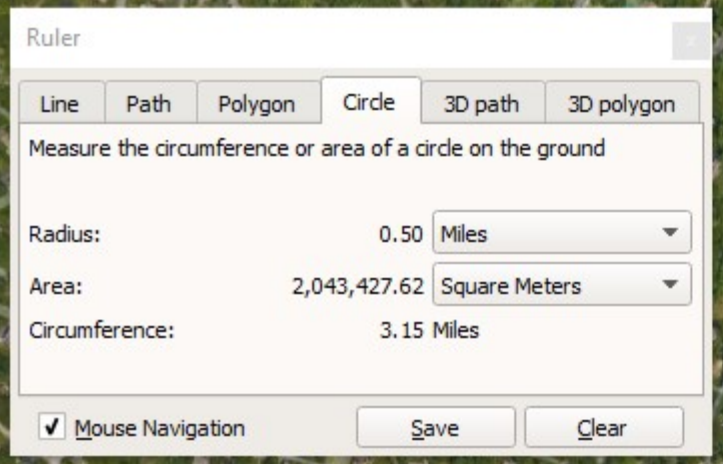
[CBRS RRH] Spec.



Current Size: 216 x 307 x 105.5 mm (6.99L)
(8.5 x 12.1 x 4.1 inch., excluding Port Guard)
Design is subject to minor change

Item	Specification
Band	Band 48 (3.5 GHz)
Frequency	3550~3700 MHz
IBW	150 MHz
OBW	80 MHz
# of Carriers	5/10/15/20 MHz x 4 carriers
RF Chain	4TX / 4RX
RF Output Power & EIRP	4 path x 5 W (Total: 20 W = 43 dBm) (EIRP: 47 dBm / 10 MHz)
RX Sensitivity	Typical : -101.5 dBm @ 1 Rx (3GPP 36.104, Wide Area)
Modulation	256-QAM support (1024-QAM with 1~2dB power back-off)
Input Power	-48 VDC (-38 to -57 VDC, 1 SKU), with clip-on AC-DC converter (Option)
Power Consumption	About 160 Watt @ 100% RF load, typical conditions
Volume	**Under 7L** (w/o Antenna), Under 9.6L (with antenna)
Weight	**Under 8.0 kg** (**18.64** lb) (w/o Antenna), Under 10.5 Kg (with ant.)
Operating Temperature	-40°C (-40°F) ~ 55°C (131°F) (W/o solar load)
Cooling	Natural convection
Unwanted Emission	3GPP 36.104 Category A
	[B48] : FCC 47 CFR 96.41 e)
Optic Interface	20km, 2 ports (9.8Gbps x 2), SFP, single mode, duplex or Bi-Di
CPRI Cascade	Not supported
# of Antenna Port	4
External Alarm (UDA)	4
RET	AISG 2.2
TMA & built-in Bias-T I//F and PIM cancellation	Not supported
Mounting Options	Pole, wall, tower, back to back, side by side (for external ant), 3 RRH with Clip-on Antenna on the pole
Antenna Type	Integrated (Clip-on) antenna (Option), External antenna (Option)
NB-IoT	Not Supported (HW Resource reserved for 1 Guard Band NB-IoT per LTE carrier)
Spectrum Analyzer	TX/RX Support
External Alarm (UDA)	4
5G NR	Support with S/W upgrade
XRAN	Support with S/W upgrade

ATTACHMENT 2


Ruler
Line
Path
Polygon
Circle
3D path
3D polygon
Measure the circumference or area of a circle on the ground
Radius: 0.50 Miles
Area: 2,043,427.62 Square Meters
Circumference: 3.15 Miles
Mouse Navigation
Save
Clear

TCS in Westport, CT
Hillspoint
Prospect Rd
Ellery Ln
Westport Town Transfer
Greens Farms Rd
Wake Robin Rd
Acorn Oaks Rd
Colonial Ce
WESTPORT 3 CT_Search Ring Center
Asellarate
95
Bridgewater
Grove Point
Mill Creek
Hillspoint Rd
Compo Rd S
Sherwood Island State Pa
Sherwood Island

ATTACHMENT 3

Site Name: ***WESTPORT 3 CT***
Cumulative Power Density

Operator	Operating Frequency	Number of Trans.	ERP Per Trans.	Total ERP	Distance to Target	Calculated Power Density	Maximum Permissible Exposure*	Fraction of MPE
	(MHz)		(watts)	(watts)	(feet)	(mW/cm^2)	(mW/cm^2)	(%)
VZW 700	751	4	1019	4075	108	0.0126	0.5007	2.51%
VZW CDMA	876.03	2	0	0	108	0.0000	0.5840	0.00%
VZW Cellular	874	4	889	3556	108	0.0110	0.5827	1.88%
VZW PCS	1980	4	2215	8861	108	0.0273	1.0000	2.73%
VZW AWS	2120	4	2517	10068	108	0.0310	1.0000	3.10%
VZW CBRS	3625	4	18	74	108	0.0002	1.0000	0.02%
VZW CBAND	3730.08	2	22131	44262	108	0.1365	1.0000	13.65%
Total Percentage of Maximum Permissible Exposure								23.90%

*Guidelines adopted by the FCC on August 1, 1996, 47 CFR Part 1 based on NCRP Report 86, 1986 and generally on ANSI/IEEE C95.1-1992
**Calculation includes a -10 dB Off Beam Antenna Pattern Adjustment pursuant to Attachments B and C of the Siting Council's November 10, 2015 Memorandum for Exempt Modification filings

MHz = Megahertz
mW/cm^2 = milliwatts per square centimeter
ERP = Effective Radiated Power

Absolute worst case maximum values used.